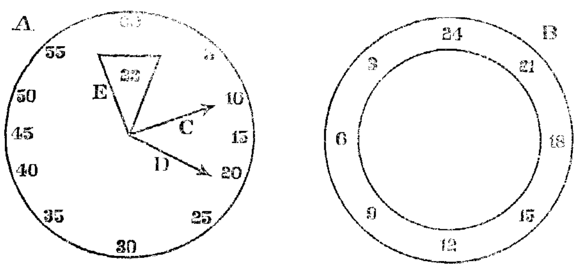
on the continent for some jewelled watches?:—A is the shape of the visible dial; C is the minute hand; D is the second-hand (sometimes dispensed with); E is an aperture in the dial through which is seen the hour, brought there by the hourly revolution of the wheel B; B is a wheel (and in watches of the size of a



shilling a series of wheels or a metallic band rolling round a drum of special construction for those tiny watches) immediately under the dial, set in motion once every hour, and bringing the corresponding numbers under the aperture E. CHATEL

Jersey, January 5

THE COAL QUESTION

IT is generally admitted that the amount of coal existing below Great Britain at such depths that it can be worked is limited, that large quantities of coal are annually used, and that even the partial exhaustion of the fields, accompanied, as it must be, by a rise in price, would seriously affect almost all our manufactures, and greatly endanger our commercial supremacy. But if we attempt to go further, and say how long our supply of coal will last, we meet with very different estimates. Nearly a hundred years ago the question was discussed by Mr. John Williams, and though the insufficiency of the data did not allow him to give a definite answer, he at least showed the vital importance of the subject.

In 1861, Mr. Hull, by taking into account the area of all our coal-fields and the thickness of the workable seams, calculated that the total available coal in Great Britain was 79,843,000,000 tons; this result was shown by a second calculation to be slightly too low. Further, he assumed that the output of coal, which was then 86,000,000 tons, could not rise much above 100,000,000, and therefore that our supply was sufficient for eight centuries.

Four years later Prof. Stanley Jevons, in an admirable essay on "The Coal Question," accepted the more important of Mr. Hull's data, but showed that they would bear a very different interpretation, and that, instead of the eight centuries spoken of by Mr. Hull, "rather more than a century of our present progress would exhaust our mines to the depth of 4000 feet." He then shows that the absolute physical exhaustion of the fields is improbable, but that before the twentieth century is far advanced the output of coal will probably be checked by a rise in price so considerable that England will be unable to compete in manufactures with other nations still enjoying the profusion of coal to which her present commercial prosperity is so greatly due. These theories and results were reviewed and strengthened by Prof. Marshall in 1878 ("Coal, its History and Uses"), with the aid of more recent statistics; and the present paper is intended to give a short and simple account of the present state of the question from the physical side, with the omission of the more difficult and dubious arguments which may be drawn from Political Economy.

The arguments of Prof. Stanley Jevons were so conclusive, and his results so alarming, that a Royal Commission, of which the Duke of Argyll was chairman, was appointed, in 1866, to investigate the probable quantity of coal contained in the coal-fields of Great Britain. In 1871 the Commission reported that the coal-fields already in use still contained 90,207,000,000 tons of coal, and that concealed coal-fields as yet unopened, near Doncaster, Birmingham, and elsewhere probably contained 56,273,000,000 tons more, or that, in all, 146,480,000,000 tons of coal were available. Since that time about 1,780,000,000 tons of coal have been raised, leaving as the available supply in 1884 about 144,700,000,000 tons. Subsequent investigations show that this estimate is probably considerably too high.

These results were intended to include all beds a foot and upwards in thickness lying within 4000 feet of the surface, though it was rendered probable at the same time that the amount of coal below 4000 feet is not very large. The reason for excluding all beds less than a foot thick is that, at present prices, it is found unprofitable to work them, and hence, except in a few special cases, they are left untouched, though rendered worthless for the future from the disturbance of the strata occasioned by working the other beds.

Though we may assign no limit below which it is impossible to work, the cost of mining increases so rapidly with increased depth that the price of coal must rise very seriously before even the 4000-foot limit can be reached. This increase of cost depends upon various causes. The mere sinking of three shafts like those of Murton, which are said to have cost 300,000*l.*, burdens the undertaking, if it last fifty years, with an interest and sinking fund at 4 per cent. amounting to 13,965*l.* per annum. More powerful winding and pumping engines must be employed, and from the great expense of shaft-sinking, larger areas must be worked from one shaft, necessitating extra expense in underground haulage, ventilation, and supports. Further, each actual coal-hewer requires a larger amount of assistance to secure his safety and to remove his winnings in a deep pit. A coal-hewer working at an open seam on the surface of the ground would only require one labourer to wheel away the coal, while in a deep mine each hewer requires about three men to attend to the removal of the coal, the pumping, and ventilation.

The high temperature of the rock at great depths is also an important factor in the expense of deep mining. In England there is found to be a uniform temperature of 50° F. about 50 feet below the surface; but this temperature is found to increase 1° F. for every 60 feet descended, so that at 4000 feet the temperature of the rock will be about 116° F. And though this temperature is not sufficiently high to prevent working, and might be lowered a few degrees by ventilation, it will cause a considerable increase in the expense, both from the lassitude and extra pay of the men, and the larger amount of air required, which even now at Hetton amounts to 450,000 cubic feet per minute.

These difficulties account for the manifest reluctance to sink deep pits, for the high price charged for the coal from them, and for the fact that the 4000-foot limit has not yet been approached. In 1846 the Messrs. Pemberton's pit at Monkwearmouth reached 1720 feet; in 1858 the Astley pit at Dukinfield reached 2100 feet; in 1869 the Rosebridge pit at Wigan reached 2448 feet; in 1881 the Ashton Moss pit near Manchester reached 2688 feet; and though the Lambert pit in Belgium has been worked at 3490 feet, the circumstances were exceptional, and it is certain that the commercial success of such a pit in England would necessitate a price of coal far higher than it at present is.

The early estimates of the annual output of coal are so unreliable that it is useless to go back further than 1854, when "Mineral Statistics" were first carefully collected by Mr. Robert Hunt, and even in these returns the amounts for the first few years are possibly as much as three per cent. too low, from the difficulties of overcoming the fears of the coal-owners as to the uses which might be made of them. These returns have been collected and arranged by Mr. Meade, in his "Coal and Iron Industries

of the United Kingdom," from which Columns I. and V. of the following table have been for the most part taken.

Since the amounts of coal used are very large, and great accuracy cannot be expected in inquiries of this nature, it is convenient to take as the unit of our calculations 1,000,000 tons of coal instead of our ordinary unit, the ton. This unit may be expressed in several different ways: a cubic yard of anthracite weighs about 2700 lbs., and of bituminous coal from 2090 to 2400 lbs., hence on an average a cubic yard of coal weighs a ton; and our unit of 1,000,000 tons is a cubical block of coal 100 yards each way, or a bed of coal a mile square and a foot thick. Column I. in the following table gives the annual output of coal since 1854, and the total output during the thirty years, which amounts to 3,245,100,000 tons.

Amount of Coal in Million Tons

Year	I. Won	II. Calculated $64{\cdot}7+3\,(n-1)$	III. Calculated $62{\cdot}85 \times 1{\cdot}035^{n-1}$	IV. Calculated $65{\cdot}5 \times 1{\cdot}0325^{n-1}$	V. Exported
1854	64·7	64·7	62·9	65·5	3·4
1855	64·5	67·7	65·0	67·6	5·1
1856	66·6	70·7	67·3	69·8	5·9
1857	65·4	73·7	69·7	72·1	6·8
1858	65·0	76·7	72·1	74·4	6·6
1859	72·0	79·7	74·6	76·9	7·1
1860	84·0	82·7	77·3	79·4	7·4
1861	86·0	85·7	80·0	81·9	7·9
1862	81·6	88·7	82·8	84·6	8·4
1863	86·3	91·7	85·7	87·4	8·3
1864	92·8	94·7	88·7	90·2	8·9
1865	98·2	97·7	91·8	93·1	9·3
1866	101·6	100·7	95·0	96·1	10·1
1867	104·5	103·7	98·3	99·3	10·6
1868	103·1	106·7	101·7	102·5	11·0
1869	107·4	109·7	105·3	105·8	10·7
1870	110·4	112·7	109·0	109·3	11·7
1871	117·4	115·7	112·8	112·8	12·7
1872	123·5	118·7	116·8	116·5	13·2
1873	127·0	121·7	120·8	120·3	12·6
1874	125·1	124·7	125·1	124·2	13·9
1875	131·9	127·7	129·4	128·2	14·5
1876	133·3	130·7	134·0	132·4	16·3
1877	134·6	133·7	138·6	136·7	15·4
1878	132·6	136·7	143·5	141·1	15·5
1879	134·0	139·7	148·5	145·7	16·4
1880	147·0	142·7	153·7	150·4	18·7
1881	154·2	145·7	159·1	155·3	19·6
1882	156·6	148·7	164·7	160·4	20·9
1883	163·8	151·7	170·4	165·6	22·8
Totals	3245·1	3246	3245·1	3251	351·7

A few comparisons may enable the mind to grasp the real meaning of these enormous figures. It was calculated by Sir Henry Bessemer that the output of coal, 154,000,000 of tons for the single year 1881, would suffice to build 55 Great Pyramids, or to rebuild the Great Wall of China, and to add a quarter to its length! In 1883 the output was 163,800,000 tons, which would form a column a mile square and nearly 164 feet high; or would build a wall from London to Edinburgh 400 miles long, and 45 feet 9 inches high and thick, or another round the world 24,000 miles long, and 5 feet 11 inches high and thick; or, if the Straits of Dover are 21 miles across and 600 feet deep, would make an embankment across them 22 yards wide: while the total output for the 30 years would build a round column 9 feet 4 inches in diameter, which would reach 240,000 miles high, the distance of the moon.

The numbers show considerable fluctuations—as might be expected from the variety of accidental circumstances, such as new inventions, the mean annual temperature, and the state of trade, which affect the amount of coal used—but, on the whole, a very rapid increase; the output for 1875 being double of that for 1854, and that for 1883 double of that for 1862.

If we assume that the increase in annual output would be constant were it not for accidental circumstances, we can represent the actual numbers, with fair accuracy, by an arithmetical series of which the first term is 64·7, and the last 151·7, the increase in annual output being 3, and the total amount 3246 (Column II.). Further it has been shown that the coal still available in 1884 is 144,700,000,000 tons, and we may assume that the output in 1884 will be at least as great as that in 1883, or 163,800,000 tons. Hence, if the output of coal continues to increase at the rate of 3,000,000 tons annually, our supply will last for 261 years, or will be exhausted about A.D. 2145.

But this calculation is open to several objections, and the numbers as shown by Prof. Stanley Jevons may bear a much more serious significance.

It is improbable that the annual difference should always remain the same, and in fact, in the calculated series (Column II.), while all the early terms are higher than the real outputs, the later terms are lower, showing that the difference itself probably increases. If we calculate the series backwards we have no output at all about 21 years before 1854, a result we cannot agree with, and for all years before 1833 a negative output, a result we cannot understand. Hence it is probable that the results may be better expressed by another kind of series.

Theory and experience show that the same causes always produce the same effects, unless fresh circumstances intervene to modify the effects produced. Thus the population of England, which was about 9,000,000 in 1801, became 18,000,000 in 1851, or doubled in 50 years; hence, if no new causes intervene, we should expect it to double again in the next 50 years, or to become 36,000,000 in 1901. This is usually expressed by saying that social statistics in general show uniform multiplication in uniform periods, or obey the compound-interest law, or form a geometrical series. As an example of this law let us examine a little more closely the population of England and Wales. The increase for each 10 years since 1801 is itself perpetually increasing, or the numbers must be expressed by a geometrical series of which the ratio is nearly 1·147, and not by an arithmetical series.

Year	1,000,000 Inhabitants	Increase in Ten Years	Calculated $8{\cdot}89 \times 1{\cdot}147^{(n-1)}$
1801	8·89		8·89
1811	10·16	1·27	10·20
1821	12·00	1·84	11·70
1831	13·90	1·90	13·42
1841	15·91	2·01	15·39
1851	17·93	2·02	17·65
1861	20·07	2·14	20·24
1871	22·71	2·64	23·22
1881	25·97	3·26	26·63
Sum...	147·54		147·34

From the dependence of the numbers representing the annual output of coal upon the number of inhabitants, it might be expected that they also can be expressed by a geometrical series, and this has been shown by Prof. Stanley Jevons to be the case. According to his calculations the ratio of the series is about 1·035, or the rate of increase of the output is about 3½ per cent per annum, and it may be assumed for the reason before given that the sum of all the outputs is likely to be more approximately correct than the single output for 1854. The annual outputs calculated from these data are given in Column III., and show a fair approximation to the actual numbers, though the first term is rather low, and the last six terms are nearly as much above the true results as those in the

arithmetical series were below them. In fact, either from a prolonged fluctuation in trade, or from the operation of the cause we are discussing, the outputs for the last six years have not increased so rapidly as the previous numbers would lead us to expect. The outputs for the years 1854-77 are very fairly expressed by a series of which the first term is 63·9 and the ratio 1·0355, but this series makes the last six terms far too high.

Again the ratio 1·03 gives 71 as the first term, and makes all the early terms considerably too high. In short, the fluctuating numbers in Column I. seem to be best expressed by a series of which the first term is 65·5 and the ratio 1·0325; the outputs calculated from these data are given in Column IV.

It is easy also to calculate backwards and obtain earlier terms in the same series, thus for 1840 an output of 43,000,000 tons is given, and for 1800 one of 11,700,000, instead of Mr. Hull's conjecture of 36,000,000 and 10,000,000 tons respectively. And taking the true output of 163,800,000 of tons in 1883 and the ratio 1·0325, we can calculate the probable output for any future year. Thus for 1901 we obtain 282,000,000 tons instead of 331,000,000 as calculated by Prof. Stanley Jevons. Further, a well-known formula gives the sum of any number of terms of the series, or we can calculate in how many years the amount of coal raised will be equal to any given amount, say to the 144,700,000,000 tons remaining in 1884 Making the calculation, we find that if the present rate of increase in the consumption of coal of 3¼ per cent. per annum continues, or, in other words, if our output of coal continues to double every 22 years, our total supply will be exhausted in 106 years from 1884, or about A.D. 1990.

Of course no one can suppose that our consumption will continue to increase until it comes to a sudden and final end, but only that within a comparatively short period our output of coal must reach a maximum, and then gradually diminish as it becomes more scarce and expensive.

These calculations, then, seem to force upon us one of four possible conclusions:—Some new source of energy may be found to supply the place of coal; a larger proportion of the energy contained in our coal may be utilised, so that an output as large as the present one may produce a much larger amount of useful work; coal may be imported from other countries to supply our deficiencies; or lastly, the commerce and manufactures of England may pass into a stationary or retrograde condition.

Coal is used directly as a source of heat in our domestic fireplaces, as a source of mechanical energy indirectly in our steam- gas- air- and electric engines, and as a heating and reducing agent in our metallurgical furnaces. A pound of fairly good coal will heat about 13,000 lbs. of water through 1° F., and in an ordinary steam boiler about 8000 of these units of heat are utilised, which suffice to turn rather more than 7·3 lbs. of water at ordinary temperatures into steam. But the unit of heat is able to do work to the extent of raising 775·4 lbs. through one foot in opposition to gravity. Hence, by burning one pound of coal, rather over 10,000,000 foot-pounds of work may theoretically be obtained. A first-rate steam-engine does effective work to the extent of about one-ninth of the theoretical amount. Hence, in round numbers, a pound of coal will do 1,000,000 foot-pounds of work, or as much work as is done by 32 ordinary men in ascending the 202 feet to the top of the Monument. According to Péclet, a pound of average coal contains ·804 lb. carbon, ·0519 lb. hydrogen, and ·0787 lb. oxygen, and would therefore theoretically suffice to reduce 8¼ lbs. of hematite with formation of 5¾ lbs. of iron. Any complete substitute for coal must be able to perform each of these three duties of coal.

It seems improbable that any new source of energy on the large scale will be discovered, though possibly small engines may be driven by some form of explosive, and hence tides, winds, and waterfalls alone, have to be considered as substitutes for coal. According to Sir William Thomson, energy in the form of electricity might be conveyed for 300 miles through a copper rod with a loss of only 20 per cent. from such a waterfall as Niagara, and stored up in secondary batteries for distribution. It is only necessary, without going into details of expense, to point out that we have no monopoly of winds, tides, or torrents, such as we have had of coal, and in fact, were they the sources of energy, we should compete with our neighbours rather at a disadvantage.

The next point to consider is how far more economical methods of obtaining and using our coal may reduce the output. It has been already pointed out that, as with coal at its present price it is not commercially possible to work seams less than a foot thick, all such coal is wasted. Large quantities of coal also are more or less unavoidably wasted in the processes of cutting and carrying, and it seems as if any great reduction in this amount must be accompanied by a considerable rise in price.

The uses to which our coal is applied, may, for the purposes of this inquiry, be roughly grouped under four heads—mining and metallurgy; manufactures, and locomotion on land and sea; domestic uses, including the supplies of gas and water; and lastly, for export. Under the first three heads, no doubt, large saving is possible, but it is not likely to be begun except under the pressure of a scarcity of coal, when the high price of the coal will cause the introduction of more expensive and more efficient machinery.

By far the most important metallurgical operation is the production of iron, which may therefore be taken as an example of the others. In 1788, 7 tons of coal were used per ton of pig-iron produced, which sank to 5 tons about 1800. The introduction of the hot blast in 1829 caused a further drop to 3½ tons in 1840; and that of regenerators in 1857 caused a further fall to 2½ tons in 1875. But the increase in the quantity of iron manufactured renders the actual saving of coal very small. In 1881, 18,300,000 tons of coal were used in making 8,300,000 tons of pig-iron, and a nearly equal amount of coal was required to convert five-eighths of the pig into wrought iron and steel. So that, in all, the iron-works required 34,700,000 tons of coal.

Experience seems to show that, though our best steam-engines give an efficiency of one-ninth, and the efficiency of air- and gas-engines is even higher, except in special circumstances, it is commercially preferable to use less efficient engines; the saving of coal at present prices being more than compensated for by the higher cost of the better engine. It is possible, however, that in the future electric engines may be used of far greater efficiency than our present steam-engines. On the other hand, the high rates of speed now demanded both for passengers and goods necessitates the consumption of large quantities of coal. Thus on a level railway a ton of load requires a pull of about 16⅓ lbs. to draw it at the rate of 29 miles per hour, while, if the rate be increased to 50 miles per hour, the pull is nearly 33 lbs. Hence the 13,500 locomotives in Great Britain will require much more coal to drag the same loads at the higher rate. Our merchant navy also is being rapidly converted from sailing into steam vessels; in the 14 years 1866-1879, the number of sailing vessels *decreased* 5600, while the steamers *increased* 2200; and the steamers engaged in the foreign trade used in 1881 5,200,000 tons of coals, in 1882 5,600,000, and in 1883 6,400,000.

The aggregation of people in towns requires the use of coal for the production of gas or electric lighting, frequently for the removal of sewage and refuse, and for the supply of water. Possibly the most wasteful use to which coal is applied is our common domestic fireplace. But it would require an enormous increase in the price of coal to induce the average Englishman to convert his genial,

wasteful, open fireplace into the dull, though economical Continental stove.

The trade in coal and coke, especially to France, Germany, Russia, and Sweden, has reached very considerable dimensions, and is, in fact, the fourth most important of our exports. In Column V. it will be noticed that the 3,400,000 tons exported in 1854 have become in 1883 22,800,000 tons, worth more than 8,000,000*l.*, or in thirty years the export of coal has multiplied more than six times. Any considerable lessening in this amount would of course seriously affect the balance of our trade with other countries.

It seems hardly necessary to meet the objection that when our own stores are exhausted we may import coal from other countries. A few considerations will show the fallacy of such reasoning. The nearest stock of coal on which we can hope to draw is that in Canada and the United States. The former supply is plentiful, but much of it is badly situated for exportation. In the United States coal is found in Virginia, Utah, and the Western States, and the basin of the Mississippi and its tributaries contains coal-fields estimated to cover 200,000 square miles, and to contain about 38 times as much available coal as Great Britain. According to Mr. Hull, these fields could as easily supply an output of 2,704,000,000 tons as we can one of 90,000,000.

Putting aside the commercial difficulties dwelt on by Prof. Stanley Jevons in the way of converting a large export trade in our staple raw material into an immensely larger import trade, the fact that even now the rivalry with the ingenuity and perseverance of the American manufacturers, aided though we are by their high tariff, demands all our skill and energy, and the almost universal law that manufactures cluster round the source of power, the physical difficulties of such a traffic would be enormous. Suppose a steamer similar to the *Faraday* capable of carrying 6000 tons, and so swift as to be capable of making 13 trips from America in the year; she would annually bring 78,000 tons of coal, or it would require a fleet of 2100 such ships to supply even our present requirements. And if the coal could be supplied to our shipping in American ports at 10*s.* a ton, we should have annually to pay America 81,900,000*l.*, an amount not far below our present national income. The further cost of carriage across the Atlantic and delivery in English towns, must raise the price of coal to many times what we at present pay.

We are brought, then, face to face with the last of the four above-mentioned possibilities. Before very many years are past we must expect that the scarcity of coal in England will cause a considerable rise in price, which will directly affect all such branches of trade and manufactures as depend upon coal, and indirectly all other branches.

What this means in the former case will be evident from a brief consideration of the uses to which coal is applied, a few instances of which have already been given. Let us take one instance of the latter class—the importation of food-stuffs. The increase in the population of England per square mile, which was 37 in 1066, 75 in 1528, 140 in 1780, 241 in 1831, and 443 in 1881, higher than any civilised country except Belgium, has taken place far more in manufacturing than in agricultural districts, and has necessitated a great change in our supply of food. Previous to 1780, though luxuries were imported, the staple food-stuffs, corn, meat, cheese, &c., were produced at home; now, on the other hand, we import more than one-third of our meat, half of our cheese, and nearly two-thirds of our wheat. Owing to our luxuriousness and to this large importation of food, averaging 212 lbs. annually per head, the average annual cost of food per head in England, 13*l.* 9*s.*, is higher than that in any other country. When by the scarcity of our coal our pre-eminence in cheapness of manufactures becomes a thing of the past, the means of paying for this food will gradually cease, and the pressure of population, together with the increased cost of the necessaries of life, by emigration, by an increased death-rate, and by a reduced birth-rate, will change the England of to-day into a country like the England of 1780,—a country with a comparatively scanty population, with few manufactures, supporting themselves by the produce of their fields, and looking back on the England of to-day as the Spaniard now looks back on the Spain of Philip II.—of Philip, the husband of Mary of England, the ruler of Spain, Portugal, the Netherlands, the Milanese, of Malabar, Coromandel, and Malacca—of Philip, whose father had sent Cortez to conquer Mexico, and Pizarro to Peru, and who himself, by the conquest of Portugal, had annexed the valuable province of Brazil. Looking at such a picture, is it impossible that the England which now rules over 8,600,000 square miles, containing 283,000,000 inhabitants, should shrink to its former limits of 122,000 square miles, with 8,000,000 inhabitants?

Finally, let us consider if anything can be done to defer or mitigate this change in the condition of our descendants. After discussing and rejecting the expediency of limiting or taxing our output or export of coal, on the ground that any such measure would impose a serious burden upon our manufactures and commerce, and in fact produce the very result we are trying to avoid, Prof. Stanley Jevons proposed that instead of relieving ourselves by the remission of taxation, we should relieve our descendants by making a serious effort to pay off the National Debt. The amount of the debt, which was 900,000,000*l.* in 1815, was 839,918,443*l.* in 1857, and 756,376,519*l.* in 1883. Thus in 68 years about 144,000,000*l.* have been paid off. He proposed that the probate, legacy, and succession duties, as being in reality capital and not income, should be applied to this purpose. These duties amounted in 1883 to about 5,600,000*l.*, and would suffice to pay off the National Debt in about 55 years. These proposals have been in part carried out. The amount of taxes remitted has of late years been considerably reduced, and in 1883 terminable annuities were created, which in 20 years will reduce the debt by 173,000,000*l.*

On the other hand, the rapid increase in local obligations to some extent renders nugatory this attempt at national economy. It is somewhat difficult to obtain accurate data on these points, but the bonds of the Metropolitan Board of Works, of Liverpool, of Manchester, and of Leeds, quoted on the Stock Exchange, represent a sum of 34,000,000*l.*, and no doubt other towns are following far too rapidly in the same direction. Of course some of this expenditure represents profitable enterprises, such as the supply of gas and water, but it is to be feared that a considerable amount has been spent in ways less directly or indirectly remunerative.

If, then, we are unable to arrest the action of those physical and commercial laws which will press with more and more severity on our descendants, let us do what we can to mitigate their fate by using every exertion to avoid unnecessary increase in our obligations, and to reduce those transmitted by our fathers. It would probably be well also to appoint a fresh Royal Commission to investigate more accurately than has yet been done the various data upon which these calculations depend, to make more widely known any improvements made during the last thirteen years which may prolong the duration of our coal, and to consider the most important financial questions which are involved in this inquiry.

And at last, when the worst comes to the worst, we may take comfort from the thought that, beyond the four seas, new Englands, as yet hardly conscious of their capacities, stretch east and west, and that the New Zealander, who a few years hence may moralise on the last stone of London Bridge, will mingle reverence with his philosophy, for he will be no dark-skinned, far-off cousin, but a ruddy, healthy grandchild.

SYDNEY LUPTON